

REMARKS

In the Office Action the Examiner noted that claims 1, 22-33 and 35-37 were pending in the application. The Examiner allowed claims 22, 23, 30-33 and 36, while rejecting claims 1, 24-29, 35 and 37. By this Amendment, claims 1, 24 and 25 have been amended. Thus, claims 1, 22-33 and 35-37 are pending in the application. The Examiner's rejections are traversed below.

Telephone Interviews

Appreciation is expressed to the Examiner for the telephone interviews granted by the Examiner on May 23, 2005 and June 3, 2005. During the interviews the applicants discussed proposals for amending independent claims 1 and 25 so as to place these claims in condition for allowance. The proposed amendments have been implemented by this Amendment. In addition, applicants discussed the cited Ketchum and Black references with the Examiner. Additional features discussed at the interview are included in the discussion below.

Claim Amendments

In view of the unusual format of reissue claims, examples of the amendments are provided below for the convenience of the Examiner. Claim 1 has been amended to recite "only one inductance element located between one of the band pass filters located at the first stage and one of the common signal terminals." Claim 25 has been amended to recite "only one impedance matching circuit located only between the first stage of the second band pass filter and the common signal terminals." Claim 24 has been amended to recite that the "inductance elements" are "respectively connected to ground in series with the first acoustic wave resonators in the parallel arms."

Prior Art Rejections Based on Hikita References

In item 4 on pages 2-3 of the Office Action the Examiner has rejected claims 1, 25, 26 and 29 as unpatentable over U.S. Patent 5,115,216 to Hikita et al. (Hikita et al. '216) taken in conjunction with Hikita JP 59-158117 (Hikita JP '117"). In addition, in item 5 on page 3 of the Office Action, the Examiner rejected claims 27 and 28 under 35 U.S.C. § 103 as unpatentable over Hikita et al. '216 in view of the Hikita JP '117 patent and further in view of U.S. Patent 4,409,567 to Setsune et al.

The Applicants' traverse the Examiner's rejections below with focus on the remaining

rejected independent claims (claims 1 and 25).

Claim 1

Claim 1 as amended specifies an arrangement where a pair of band-pass filters have a multiple ladder structure without specifying a structure of the first stage, and only one inductance element located between one of the band-pass filters and the common signal terminal. In contrast, the combination of Hikita JP '117 and Hikita '216 has two matching circuits between the first stage of both the first and second SAW filters and common signal terminals. It is submitted that it would not have been obvious to have modified the prior art arrangement to have only one inductance element located between one of the band-pass filters and the common signal terminal. Referring to the claim language of claim 1, it is submitted that the prior art does not teach or suggest the claimed band-pass filter comprising:

a pair of band-pass filters having respective pass bands and comprising a plurality of acoustic wave resonators connected in a multiple ladder structure, each having at least a first stage located at a side of the pair of band-pass filter common signal terminals and a pair of input terminals and a pair of output terminals; ...

only one inductance element located between one of the band-pass filters located at the first stage and one of the common signal terminals.

On page 3 of the Office Action the Examiner noted that the last paragraph of prior claim 1 does not exclude other inductance elements. Claim 1 has now been amended to recite "only one inductance element".

Therefore, it is submitted that claim 1 patentably distinguishes over the prior art.

Claim 25

As amended, claim 25 is directed to a band-pass filter which includes:

a first band-pass filter having a pass band, having a band center frequency and comprising a plurality of acoustic wave resonators connected in a multiple ladder structure, having at least a first stage located at a side of the pair of band-pass filter common signal terminals, a pair of input terminals and a pair of output terminals;

a second band-pass filter having a different pass band from the pass band of the first band-pass filter, having a band center frequency which is larger than the band center frequency of the first band-pass filter and comprising a plurality of acoustic wave resonators connected in a multiple ladder structure, having at least a first stage located at a side of the pair of band-pass filter common signal terminals, a pair of input terminals and a pair of output terminals; ...

only one impedance matching circuit located only between the first stage of the second band-pass filter and the corresponding common signal terminals.

On page 6 of the Office Action, the Examiner acknowledged that the Hikita/Hikita combination does not show "only one impedance matching circuit located only between the first stage of the second band-pass filter..." (emphasis in original). Accordingly the applicants have amended claim 25 based on the Examiner's comments.

Therefore, it is submitted that claim 25 patentably distinguishes over the prior art.

Claims 26-29

Claims 26-29 depend from claim 25 and include all of the features that claim, plus additional features which are not taught or suggested by the prior art. Therefore, it is submitted that claims 26-29 patentably distinguish over the prior art.

Prior Art Rejection based on Ketcham in View of Black et al.

In item 6 on pages 3-5 of the Office Action the Examiner rejected claims 24, 35 and 37 under 35 U.S.C. § 103 as unpatentable over U.S. Patent 5,231,327 to Ketcham in view of U.S. Patent 4,320,365 to Black et al.

The Examiner cited Figures 23 and 24 of Ketcham which disclose first acoustic wave resonators X2 and X4 on a piezoelectric substrate 30, wherein the first acoustic wave resonators are connected in parallel arms of a filter. Further, plural second acoustic wave resonators X1, X31, X32 and X5 on the substrate 30 are provided in the series arm of the filter to form a ladder filter.

On page 4 of the Office Action the Examiner acknowledges that Ketcham does not explicitly disclose the relation of the resonance frequency of the series resonators being equal to the anti resonance frequency of the parallel resonators and does not show bonding inductance elements from the parallel resonators and the package.

The Examiner cites Black et al. for its disclosure of using bonding wires (30 and 33 in Figure 1) which inherently have inductance to make connections to acoustic resonators. On pages 4 and 5 of the Office Action the Examiner takes the position that

“...it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the acoustic wave ladder filter of Ketcham (e.g., Figs. 23 and 24), if even necessary, such that the resonator resonance and antiresonance frequencies would have been as recited, the filter would have been in a package, and the connections from ground pads MG1 and MG2 (Fig. 24) of the parallel resonators would have been made by bonding wire inductance elements to a ground outside the piezoelectric substrate, because one of ordinary skill in the art would have known to have provided the resonator resonance/antiresonance frequency relationship in order to provide band-pass filter characteristics.”

Attached as Exhibit A is a drawing illustrating the difference between claims 24, 35 and 37 and the Ketcham/Black combination as proposed by the Examiner. In particular, claims 24, 35, and 37 recite a respective connection between the individual acoustic wave resonators in the parallel arms of the acoustic wave filter and the ground. In contrast, because Ketcham discloses ground electrodes MG1 and MG2 which are connected to each other on the piezoelectric material 30, they become a common ground configuration as shown in Fig. 25C and as described at column 11, lines 16 to 18. Therefore, a bonding wire provided on MG1 and MG2 based on the teachings of Black, would produce the arrangement illustrated by the lower drawing of Exhibit A and would not provide the claimed arrangement as set forth in the claims.

In addition, the above difference in configuration provides significantly differently feature characteristics. Attached Exhibit B illustrates the difference between the present claimed invention (with package (solid line) or without package (one dot line)) and the prior art (common GND (two dots line)). Thus, as illustrated therein, the Ketcham/Black combination does not produce a large pass bandwidth (arrow 75), a large side lobe suppression factor (arrow 76) and

a low insertion loss (arrow 77) as stated at column 10, lines 22-24 and Figure 14 of parent patent RE 37,375. Thus, the common ground configuration used in Ketcham does not achieve the same affect as the present claimed invention.

Evidence of the difference in frequency characteristics between the present invention and the Ketcham/Black combination is also provided by U.S. Patent Publication 2003-058066 which is not prior art against the subject application. Figure 18 of the '066 Patent Publication shows a conventional circuit corresponding to the Ketcham /Black combination. Figure 4 shows an arrangement similar to the present claimed invention. Figures 6, 9, 12 and 17 show the frequency characteristics comparing the embodiments with the conventional circuit of Figure 18. Figure 6 shows the frequency characteristics of the first embodiment (Fig. 4) and the conventional circuit (Fig. 18). Similarly, Figures 9, 12 and 17 compare Figure 18 with the embodiments of Figures 7, 10 and 13 respectively.

Referring to claim 24, it is submitted that the prior art does not teach or suggest the claimed acoustic wave filter including:

a plurality of second acoustic wave resonators on the piezoelectric substrate, each having a pair of terminals and a predetermined resonance frequency (frs) approximately equal to the predetermined antiresonance frequency of the first acoustic wave resonator (fap), said second acoustic wave resonators being provided in a series arm of the acoustic wave filter; and inductance elements respectively connected to ground in series with the first acoustic wave resonators in the parallel arms.

Therefore, it is submitted that claim 24 patentably distinguishes over the prior art.

Referring to claim 35, it is submitted that the prior art does not teach or suggest the claimed bandpass filter which includes:

bonding inductance elements, said parallel arms of said ladder formation being connected to ground via respective said bonding inductance elements,

a package in which the band-pass filter is mounted, contains a piezoelectric substrate and the ground; and

Therefore, it is submitted that claim 35 patentably distinguishes over the prior art.

Referring to claim 37, it is submitted that the prior art does not teach the claimed bandpass filter which includes:

bonding inductance elements, said parallel arms of said ladder formation being connected to ground via respective said bonding inductance elements, wherein:

the plurality of acoustic wave resonators are on a piezoelectric substrate; and

the bonding inductance elements are respectively connected to the ground outside the piezoelectric substrate.

Therefore, it is submitted that claim 37 patentably distinguishes over the prior art.

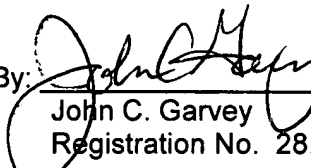
Summary

It is submitted that none of the references, either taken alone or in the combination, teach the present claimed invention. Thus, claims 1, 22-33 and 35-37 are deemed to be in a condition suitable for allowance. Reconsideration of the claims and an early Notice of Allowance are earnestly solicited.

Respectfully submitted,

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